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THIS IS UNEVALUATED INFORMATION

1. The Department of Durability (Otdel Prochnosti) of the Central Scientific Research Institute of Technology and Engineering at Moscow (TsNIITMash) studies problems of the structural durability of machine-building materials and of the means of strengthening them and applies the results obtained in a practical manner to the construction of machines.

Personnel

2. The former director of TsNIITMash, Professor I.A. Oding, took a close interest in the labors of the department. He often set problems to be investigated by the department and supervised the execution of the work.

3. Following is a list of the names of most of the scientists and engineers working in the Department of Durability:

V.V. Aleksandrov, Engineer
M.B. Berezhinskiy, Engineer
Yu.M. Bogatyrev, Engineer
L.P. Bogomolov, Cand. of Tech. Sc.
M.I. Chuloshnikov, Engineer, Stalin Prize Winner
Ya.I. Diker, Engineer
V.G. Galkina, Engineer
V.P. Glukharev, Engineer
I.N. Grabov, Engineer
A.I. Grubin, Engineer
A.I. Isayev, Cand. of Tech. Sc.
I.M. Kalmykov, Engineer
S.G. Khayfets, Cand. of Tech. Sc.
D.M. Khayt, Cand. of Tech. Sc.

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M.M. Kobrin, Engineer
I.R. Kryanin, Cand. of Tech. Sc.
I.V. Kudryavtsev, Cand. of Tech. Sc., Stalin Prize Winner
M.N. Kunyavskiy, Cand. of Tech. Sc.
V.N. Novikov, Engineer
V.I. Plavskiy, Engineer
D.G. Polyakov, Engineer
A.V. Ryabchenkov, Cand. of Tech. Sc.
M.M. Saverin, Cand. of Tech. Sc.
N.V. Skrabelinskiy, Engineer
B.A. Speranskiy, Engineer
D.N. Vidman, Engineer
S.I. Yatskevich, Cand. of Tech. Sc.
I.F. Zudin, Engineer (also works in other departments)

Activities

4. The Department of Durability has produced several different testing machines which have been adopted by the laboratories of other scientific institutes and factories. Between the years 1943 and 1946, testing machines IM-4, IM-4A, IM-4R, and IM-12R type were produced. The designers, engineers Kudryavtsev and Chuloshnikov, received Stalin Prizes.

5. Following is a description of some of the IM type machines produced by the department:

a. The IM-4R type is a lever-pendulum testing machine for testing tensile, compressive, and shearing strengths, using a maximum stress of 4,000 kg. Specimens up to 150mm in length can be tested on the machine. The distortion indicator registers distortions in a ratio of 100:1. The machine is actuated by 0.25 kilowatt motor with reversible action.

b. The IM-12R type, designed by Kudryavtsev, can exert a maximum force of 12,000 kg, and is driven by a 0.5 kilowatt motor.

c. The IM-30R testing machine was built by Chuloshnikov's design in 1950. It is capable of exerting a force of 30,000 kg, and is used for testing tensile, compressive, shearing, and bending strengths of materials. Distortions are registered in a ratio of 100:1. It is at present in series production for the laboratories of other institutes and factories.

6. The UIMP type machine for testing fatigue was built in 1947 to the designs of Engineers Yatskevich and Polyakov. The machine is constructed on the same principle as Shenk's machine. Shenk's machines, however, which are fairly widely adopted by laboratories of various institutes, only allow one to determine the fatigue limit of circular bending in specimens having a maximum diameter of 7.52 mm, whereas UIMP machines are designed for testing specimens of 18 mm diameter. Each UIMP machine is intended for the testing of two specimens simultaneously. The machine has two shafts individually driven by an electric motor at 1,500 and 2,800 r p m. Three UIMP machines have been erected in the Fatigue Endurance Laboratory of the Institute, for testing not only ordinary steels but also high-grade steels, cast iron, and non-ferrous alloys. This laboratory also has machines of the UI-40 type (TsNIITMash) and TsIM type (Central Institute of Metals).

7. Following are some other testing machines and instruments constructed by the Department of Durability.

a. Metal creep testing machine designed by engineer B.A. Speranskiy. It uses the tensile method of testing metal creep. It is installed in the Laboratory of Metal Creep and is being built in small series for other scientific establishments.

b. Instruments for measuring microhardness (mikrotverdost) of metals. Although they are installed in laboratories like that of the Institute of Machine Management (Mashinovedeniye) of the Academy of Sciences of the USSR, the TsNIITMash engineer D.N. Vidman was responsible for preliminary investigations.

c. Angle tensometers (ugolny tenzometr) for measuring deformatives, strains, and stresses. Designed by G.I. Aleksandrov.

d. Electrometrical appliances with wire resistance indicators (provolochnyye datchik soprotivleniya), for the analysis of power stresses set up when machines are at work.

e. Pendulum copers for determining resilience (udarnaya vyazkost) of metals (a 15kg pendulum coper).

8. M.M. Saverin has conducted investigations in shot blasting of working surfaces of metal parts, with the object of increasing their service durability and resistance to fatigue. Saverin has made a thorough study of German, English, and American literature dealing with this subject. He has now designed a shot-slinging machine which has been built in the machine assembly shop of the Experimental Factory of TsNIITMash. With the aid of this machine, experiments are being carried out in cold surface hardening of various machine components, such as ball-bearing rings, car springs, spiral springs, valve springs etc. Good results have been obtained. Processed parts are tested in machines of Shenk or UIMP type in fatigue endurance laboratories. The shot-slinging machine has a rotor of 350mm diameter. An elevator lifts pellets from the lower hopper upwards, whence they enter the rotating part of the machine, and are made by centrifugal force to bombard the object to be hardened. Pellets have a diameter of 1 - 2mm. Engineers N.V. Skrabelinskiy and V.I. Plavskiy took part in designing this machine. This machine is now in series production at various factories. It is called DU-1 (Drobestruynaya Ustanovka - Shot-Jet Installation).

9. It would be difficult to enumerate all the labors and investigations of the Department of Durability, owing to their great variety. The following may be given as examples:

a. At the present time several laboratories of the department are working out means of strengthening water-turbine vanes made of carbon and low-alloy steels, by means of case hardening. Hitherto these blades have been made of stainless steel, which does not lend itself readily to casting and heat treatment.

b. The influence of surface treatment on fatigue resistance is being investigated. New processes have been evolved whereby fatigue resistance of steel has been increased by 100 per cent.

c. New methods of testing relaxation and creep of metals have made it possible to evolve the most suitable grades of heat-resisting and creep-resisting steels, which are so much needed in modern machine building, e.g., gas turbines with a working temperature of 100°.

d. Problems of resistance to wear are also being studied. These are of great importance in the construction of worm and other types of reduction gears.

10. The Case Hardening Bureau, under the guidance of Professor V.I. Prosvirin, fulfilled a complicated task in working out methods of nitriding stainless, heat-resisting steels EI-123, EZh-1, and other brands. These methods have been assimilated by several factories, among them the Leningrad Engineering Works imeni Stalin which produces high-power steam turbines. This works used this process for nitriding turbine nozzle segments made of heat-resisting steel. The rapid wearing away and destruction of these nozzles by steam

ceased after nitriding. To supervise the adoption of this method, TsNIITMash detached two scientific workers who, together with the Works Laboratory, perfected it sufficiently for industrial adoption.

11. L.P. Bogomolov and I.R. Kryanin with the assistance of other engineers designed an automatic machine for the heat treatment of long pump rods used in pumping crude oil. The machine treats about 40 rods per hour when hardening with oil and about 50 rods per hour when hardening normally. All operations have been made automatic. Engineers Bogomolov, Kryanin, Gorozhankin, and Kalmykov were sent to the Petroleum Machine-Building Works No. 427 imeni Lieutenant Shmidt at Baku, where the machine had been installed. Works tests gave very good results.

12. In the laboratory and bureau of the Department of Durability a method of electric spark hardening was evolved.

13. Large-scale investigations were carried out in annealing case-hardened structural steel. Fundamental work in this field was done by Engineer Yu.M. Bogatyrev in the Central Bureau of Case Hardening (TsBPZ).